REMARKS

Applicants have thoroughly considered the Examiner's remarks and have amended the application to more clearly set forth the invention. Applicants acknowledge the Examiner's statement that claims 18-22 and 34 are allowed, and that claims 3, 8-13, 29, 30, and 32 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Claims 1, 3-6, 25, 30, 32, and 33 have been amended by this Amendment A, and claims 2 and 26 have been canceled. Applicants respectfully request allowance of claims 1, 3-17, 23-25, and 27-33 in light of the amendments and following remarks.

Section 102(e) Rejections

Claim 1 is rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 6,601,388 to Gladden. Claims 7, 14-16, 25-28, 31, and 33 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 6,647,723 to Sun et al. (Sun). A claim is anticipated only if each and every element as set forth in the claim is disclosed, either expressly or inherently, in a single prior art reference. Verdegal Bros. v. Union Oil. Of California, 814 F.2d 628, 631 (Fed. Cir. 1987). Applicants submit that each and every element as set forth in the recited claims is not found, either expressly or inherently, in Gladden or Sun. Thus, the cited references do not anticipate the claims.

Gladden discloses a system for use with an internal combustion engine to achieve more effective bleeding of compressed combustion air or a fuel/air mixture from a compressor to a turbine over a wider range of operating conditions. (See Gladden, column 4, lines 66-67; column 5, lines 1-2.) More specifically, Gladden discloses a controller that determines the onset or existence of a surge condition within a turbocharger and controllably actuates a valve to bleed compressed combustion air or the compressed fuel/air mixture within a volute section associated with the compressor through a conduit to a volute section associated with the turbine. (See Gladden, column 3, lines 65-67, column 4, lines 1-2.) The Office action contends that Gladden discloses a control system that controls the speed of a diesel engine. (See Office action at page 3.) However, the focus of Gladden is controlling a bleed valve in a conduit that fluidly couples a volute section associated with the compressor to a volute section

associated with the turbine. Although Gladden discloses a controller that is responsive to sensed parameters, it fails to teach or suggest a controller that controls engine speed as function of sensed parameters.

In contrast, this patent application discloses an engine controller for controlling one or more engine system operational controls such as engine speed in response to an input signal received from a sensor sensing various operating parameters. (See application page 12, paragraphs 37-38.) For example, the present application discloses an embodiment of the present invention in which "the engine control system increases the speed of the diesel engine 102 when the senor signal indicates the air pressure within the intake manifold has decreased by 8 pounds per square inch (psi), followed by an increase in air pressure of 4 psi occurring within one second of the 8 psi decrease." Application page 14, paragraph 43. As described in the application, such a spike in the air pressure of the intake manifold is indicative of a surge event. (See Application page 14, paragraph 43.)

To this end, amended claim 1 recites, an engine control system responsive to the sensor signal for controlling a plurality of operational controls ***including a speed*** of the diesel engine, wherein the engine control system modifies one or more operational controls ***including the speed*** of the diesel engine when the sensor signal indicates a surge event. Gladden fails to teach or suggest modifying and/or controlling the speed of a diesel engine as a function of the sensed parameter and consequently, cannot anticipate each and every element as set forth in claim 1.

Sun discloses a control system for use with a turbocharged engine that allows the engine to develop increased low speed torque without undesirable consequences on tailpipe emissions, such as smoke in the engine exhaust. In particular, Sun discloses an engine control system in which a software program implements an algorithm to control various engine functions. According to the Office action, Sun discloses an engine control system for controlling a speed of operation of the diesel engine. (See Office action at page 4.) However, the purpose of the control system disclosed in Sun is to control the opening of intake valves and exhaust valves, and to control engine fueling via fuel injectors. For example, Sun discloses that when the algorithm 50 is executed, it first determines whether specific conditions are met (e.g., engine control powered up and engine running at a speed less than

peak torque speed), and, if so, causes the engine control to retard the timing of the opening of exhaust valves in relation to the base line timing value. (See Sun, column 5, lines 48-56.) In a next step, the algorithm causes the control to increase engine fueling in accordance with the increased boost resulting from retarding the timing of exhaust valve opening. (See Sun, column 5, lines 56-61.) Thereafter, the algorithm determines if the turbocharger has begun to surge as a result of the delay in opening the exhaust valves, and if so, causes the control 30 to control ***the exhaust valves*** in a manner that counteracts the incipient surging. (See Sun, column 6, lines 1-6.) In other words, Sun discloses a control system for controlling the operation of exhaust valves in response to a detected surge event.

Claim 7 recites "an engine control system responsive to the sensor signal for controlling a speed of operation of the diesel engine, wherein when the engine system experiences a surge event, the engine control system increases the speed of the diesel engine to reduce turbocharger surge." Amended claim 25 recites, in part, "determining a change in the sensed operating parameter indicative of a surge event," and "***controlling a speed of the engine in response to a determined change.***" Sun fails to teach or suggest controlling these claimed features and, thus, claims 7 and 25 are allowable over this cited reference.

Claims 14-16 depend from claim 7, and claims 27-28, and 31 depend from claim 25. These dependent claims are allowable for the same reason as the independent claims from which they depend.

Claim 33 has been rewritten in independent form and now recites, in part, "determining a change in the sensed operating parameter indicative of a surge event," and "controlling a horsepower load on the engine in response to the determined change." Sun fails to teach or suggest controlling a horsepower load on the engine system in response to a surge event. Accordingly, claim 33 is allowable over the cited reference.

Section 103(a) Rejections

Claims 4 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gladden in view of U.S. Patent No. 6,415,606 to Bowman et al. (Bowman.) As explained below, applicants submit that the cited references, even when combined as suggested in the Office action, fail to teach or suggest all of the features of applicants' claims. Thus, *prima*

facie obviousness has not been established. (See MPEP 2142 and 2143.) The Office action acknowledges that Gladden fails to disclose an engine control system controlling a horsepower rating of an electrical transmission system, but contends that it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the engine control system controlling a horsepower rating of an electrical transmission system as taught by Bowman to improve the efficiency and performance of the Gladden device. (See Office action at page 6.) However, as described above, Gladden fails to teach or suggest a controller that controls a horsepower rating of an electrical transmission system as a function of sensed parameters, and Bowman fails to remedy the deficiencies of Gladden.

Bowman discloses a motor-assisted turbocharger system in which the electrical energy being provided to a motor-assisted turbocharger is controlled at a plurality of discrete energy levels to provide generally increased air pressure to the engine at a plurality of discrete air pressure levels above ambient air pressure as a function of the plurality of discrete operating power levels of the engine. (See Bowman, column 3 line 23 –34.) For example, Bowman discloses that when a locomotive is in a low power region of operation (e.g., notches 1, 2, and 3), a controller controls the supply of electrical energy from alternator 16 to motor/alternator 50 to rotate or spin compressor 48 faster than compressor 48 would normally be spun due to the low volume of exhaust gas from diesel engine 12 to expander 44 to provide a generally constant increased level of air pressure above ambient air pressure to diesel engine 12. (See Bowman, column 3, lines 23-36.) As a result, for each notch position in the lower power regions of operation, motor/alternator 50 is operated in discrete constant modes, e.g., resulting in a constant speed and/or constant increased air pressure level above ambient air pressure for each of the notch levels. Increasing the speed of the rotation of a shaft of turbocharger 40 results in an increase in the intake air pressure and mass flow rate to diesel engine 12 thereby reducing emissions such as smoke, unburned hydrocarbons, and carbon monoxide, and improving fuel economy, and increasing engine power output. (See Bowman, column 3, lines 36-41.) In other words, Bowman discloses a control system that increases the supply of electrical energy to a compressor as a function of throttle position to control the air pressure level being provided to the engine. However, unlike the present invention, the controller disclosed in Bowman does not teach or suggest a control system for modifying one or more

operational ***controls including a horsepower rating*** of the diesel engine when the sensor signal indicates a surge event.

As described in the present application, the "surge margin" is the measure of how far the operating point lies from the surge line. Variables such as ambient conditions, degradation of system performance, or malfunctions within the engine system can reduce this "surge margin" and bring about unexpected and undesired turbocharger surging. (See Application paragraph 11, page 12.) Thus, increasing the surge margin improves system performance, and applicants have recognized that by derating the horsepower of the engine 102, a decrease in the pressure ratio may occur thereby increasing the surge margin.

To this end, claim 4 has been rewritten independent form and now recites, in part, "an engine control system responsive to the sensor signal for controlling a plurality of operational controls of the diesel engine including a horsepower rating of an electrical transmission system, and wherein the engine control system modifies a load on the diesel engine system when the sensor signal indicates a surge event." Controlling the supply of electrical energy from an alternator to motor/alternator as a function of throttle position to rotate or spin compressor 48 faster (i.e., increase speed of the compressor) is not the same as modifying a load on the diesel in response to a detected a surge event. Thus, even when combined as suggested in the Office action, Gladden and Bowman fail to teach or suggest each and every element of the claim 4. As such, claim 4 is allowable over the cited references. Claims 5 and 6 depend from claim 4 and are allowable over the cited references for the same reason as the independent claim from which they depend.

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gladden in view of U.S. Patent No. 5,929,610 to Friedlander et al. (Friedlander). It is acknowledged that Gladden fails to teach a detailed structure of an electrical transmission such as recited in claim 6, but the Office action contends that it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the detailed structure of an electrical transmission, as taught by Friedlander to improve the efficiency and performance of the Gladden device. (See Office action at page 7.) Applicants submit that the combination of Gladden and Friedlander fails to teach or suggest each and every element of the claimed invention.

Friedlander discloses a protection circuit for preventing damage to a locomotive propulsion system experiencing a short-circuit or a shoot-through condition in an output circuit of a power alternator. For the purpose of responding to faults in the propulsion system, a controller is supplied with various feedback signals whose values may vary with the magnitude of the monitored characteristic, e.g., speed, current, and voltage. If signals indicate that a characteristic is abnormally high or low (e.g. fault condition exists), the controller automatically executes certain protective functions and, at the same time, sends appropriate messages or alarm signals to a display module 30 in the cab of the locomotive. (See Friedlander, column 6, lines 4-12.) For example, Friedlander discloses that, in response to a fault signal, the magnitude of the DC bus voltage drop causing generation of the fault signal is compared to a preselected threshold magnitude and the generator field excitation reduced if the DC bus voltage drop exceeds the threshold magnitude. (See Friedlander, column 3, lines 23-27.) However, Friedlander does not teach or suggest a control system that modifies a load on the diesel engine system when the sensor signal indicates a surge event. Thus, even when combined as suggested by the Office, Gladden and Friedlander fail to teach or suggest each and every element of claim 4. Accordingly, claim 4 is allowable over the cited references. Claim 6 depends from claim 4 and is allowable for the same reason as the independent claim from which it depends.

Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sun in view of U.S. Patent No. 4,012,942 to Harned (Harned). Applicants submit that the combination of Sun and Harned fails to teach or suggest each and every element of the claimed invention.

Harned discloses a spark knock detector circuit that senses the level of knock vibrations produced in an engine, and that is ***responsive to engine speed*** to generate a signal representing a borderline knock level, and an amplitude discrimination circuit for comparing the knock level with borderline knock values to determine when the knock intensity exceeds ***the borderline knock level***. (See Harned, column 1, lines 57-64.) A spark knock in spark ignition engines produces a characteristic pinging sound that is audible to the human ear if the knock intensity is high enough, and borderline knock is a knock intensity level at which the pinging sound is barely discernible to the trained ear of a person riding within the vehicle. (See Harned, column 1, lines 11-18.) As the Office action correctly points out, Harned

discloses that a sensor comprising an accelerometer such as a piezoelectric transducer is mounted on a vehicle engine to detect engine vibrations. The sensor output signal is an electrical representation of the engine vibration, which is caused by spark knock and by other noise sources referred to herein as engine background noise. The signal is filtered to remove background noise and is compared to a threshold to determine if a borderline knock level has been reached. (See Harned, column 1, lines 54-67.) In contrast, the accelerometer disclosed in the present application is associated with a surface of the air inlet or air plenum and is used to sense the change in vibration of the surface within a preset period of time or a deflection greater than a predetermined amount to determine if a surge event has occurred. (See Application page 15, paragraph 47.) To this end, amended claim 17 recites a strain gauge or an accelerometer associated with a surface of an air intake system of the turbocharger and the sensor signal represents a vibration or a deflection, respectively, of the surface of the air intake system, and wherein the control system increases the speed of the diesel engine when the sensor signal indicates an increase in the vibration within a preset period of time indicative of a surge event or indicates a deflection greater than a predetermined amount indicative of a surge event. The fact that a similar component (i.e., an accelerometer) is used in Harned does not render claim 17 obvious when combined with Sun, especially when the components are used for two completely different purposes.

Moreover, the combination of Sun and Harned fails to teach or suggest an engine control system responsive to the sensor signal for controlling a speed of operation of the diesel engine, wherein when the engine system experiences a surge event, the engine control system increases the speed of the diesel engine to reduce turbocharger surge as recited in claim 7. As such, claim 7 is allowable over the cited art. Claim 17 depends from claim 7 and is allowable for the same reason as the claim from which it depends.

Claims 23 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bowman in view of U.S. Patent No. 4,309,871 to Venema et al. (Venema). Applicants submit that the combination of Gladden and Friedlander fails to teach or suggest each and every element of the claimed invention.

Venema discloses a system for dynamically varying the ***speed of a compressor*** to vary its capacity so that the slope of the discharge pressure versus discharge flow rate characteristic

curve and, thus, prevent a surge condition. (See Harned, column 4, lines 65-68; column 5, lines 1-4.) Venema further discloses that differential amplifiers 43 and 44 ***respond to an actual speed signal*** from the tachometer and to the desired speed signal from potentiometer 41 to regulate the fuel control valves 45 and 46 to vary the fuel flow to combustion chambers 11 and 12 as necessary to drive generator 21 at the desired constant speed. At the same time, the speed of compressor 10 is adjusted to establish the flow rate of the compressed air at a steady state operating point on the compressor's pressure-flow characteristic curve. (See Harned, column 6, lines 19-28.)

Claim 23 recites "a controller adapted to receive the generated sensor signal for increasing the engine speed from a first discrete speed to another discrete speed for a predetermined period of time when a change in the sensor signal over time indicates a surge event." Venema not only fails to teach or suggest increasing the engine speed from a first discrete speed to another discrete speed for a predetermined period of time when a change in the sensor signal over time indicates a surge event, but teaches away from this claimed aspect of the invention by disclosing that the fuel control valves are regulated "to vary the fuel flow to combustion chambers 11 and 12 as necessary to drive generator 21 at the ***desired constant speed.***" Accordingly, whether considered alone or in combination, Bowman and Venema fail to teach or suggest each and every element of claim 23, and, therefore, claim 23 is allowable over the cited references. Claim 24 depends from claim 23 and is allowable for the same reason as the claim from which it depends.

Allowable Subject Matter

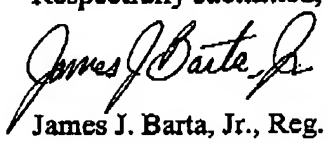
Claims 3, 30, and 32 have been amended as suggested by the Examiner to include the limitations of their respective base claims. As suggested by the Examiner, claim 3 has been rewritten in independent form to include the limitations of claim 1, and claims 30 and 32 have been rewritten in independent form to include the limitations of claim 25. Thus, claims 3, 30, and 32 are in condition for allowance.

Conclusion

It is felt that a full and complete response has been made to the Office action, and Applicants respectfully submit that claims 1, 3-25, and 27-34 are in condition for allowance and that the entire application is now in condition for allowance. If the Examiner feels, for any reason, that a personal interview will expedite the prosecution of this application, he is invited to telephone the undersigned.

The Commissioner is hereby authorized to charge any deficiency or overpayment of any required fee during the entire pendency of this application to Deposit Account No. 07-0846.

Respectfully submitted,



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